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ABSTRACT

This study was undertaken to demonstrate the effectiveness of utilization of discovery learning episodes with four different treatment groups: one seventh-grade history class; two preservice education classes (elementary and secondary); and an in-service teacher workshop. The discovery episodes consisted of readings, large- and small-group discussions, individual and group projects, and role playing of the project outcomes. Pre- and post-instruction interest level measurements were administered. Significant differences were found between each group's initial and postinstructional interest level. Subjects favored the use of a wide variety of activities and resources and agreed that the group discussion and role playing aspects of the discovery episodes were most effective. The results of the study support the hypotheses that a) discovery learning produces increased interest and involvement in the content to be learned; b) utilization of a wide variety of resources and activities can be an effective tool for maintaining a high level of student interest; and c) teachers may be able to improve the overall effectiveness of student learning through discovery learning techniques. From the results of this study, it appears that properly employed discovery episodes may improve the psychological, affective, and social dimensions of the classroom. The study report includes five appendices and a brief bibliography. (HMD)

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Discovery Teaching and Increased Student Motivation

Student motivation is a constant concern of teachers in both elementary and secondary schools. Many classes are continually plagued by low student interest and involvement despite the exciting times in which we live. In order to increase student motivation teachers should use discovery activities in their classes.

Discovery can be defined as teaching-learning activities which provide students with a minimum number of cues with which to develop their own conclusions and answers. When employing discovery, teachers attempt to create an environment (psychological, instructional and social) where students become involved in investigations or explorations of their own aimed at finding necessary information, developing new concepts and principles, and seeking solutions to problems.

Discovery learning is based upon an open psychological climate where students are free to form new ideas, express their thoughts, draw conclusions, debate evidence, challenge each other and the teacher, and refute unsupported claims. Such a psychological climate is necessary for the stimulation of cognitive involvement (curiosity), creative problem solving and critical thinking.

The instructional environment includes a wide variety of educational media used as springboards (initiators of student thinking and exploration) and as data sources (sources of evidence necessary for accepting, modifying or rejecting student hypotheses, opinions and judgements). During discovery learning, the instructional environment

(materials, learning activities, teacher behavior) is usually structured so that students attempt to bring closure to situations that are left open or unanswered by design.

The social climate necessary for effective discovery learning includes variables important to many group problem-solving situations: mutual trust, cooperation, self-confidence, open and effective communication, and feelings of acceptance. "The climate is informal, relaxed, and supportive."[1] The socio-emotional dimension of classroom groups is generally ignored by teachers who spend most of their time in the classroom dealing with content and school routine rather than building a strong positive group climate.

Research Findings

Discovery teaching often is associated only with inductive teaching where students proceed from specific facts to higher order concepts and/or generalizations. Wittrock has argued that it is plausible to have learners begin with higher order forms of knowledge from which they discover specific conclusions, logical answers and even other generalizations.[2] According to Wittrock discovery learning can be associated with both inductive and deductive types of teaching.

A study of inquiry teaching conducted by Massialas and Zevin exposed tenth grade world history students to new discovery episodes, usually a historical document where the origin, referents and author

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[1]Richard A. Schmuck and Patricia A. Schmuck, Group Process in the Classroom. Dubuque, Iowa: W. C. Brown, 1972, p. 120.

[2]M. C. Wittrock, "The Learning by Discovery Hypothesis." Learning by Discovery. (Edited by Lee S. Shulman and Evan. R. Keisler) Chicago: Rand McNally, 1966, p. 35.

had been deleted. Students in the study had no "preknowledge" of the problem at hand. According to the authors of the study the results clearly indicated that discovery was highly motivating in that students became personally involved with the materials and problems under investigation. This was because discovery was like a game which reinforced the element of perplexity and incentives to explore.[3]

In his study on personality and learning Kagen stated three advantages of discovery learning: (1) requires high involvement and attention, (2) increases autonomy and expectations of success, and (3) promotes more independent attitudes.[4] He concluded that the method of discovery was motivating because it uses "surprise" to capture the attention of all students, at least temporarily and because novelty is one of the most effective weapons against pupil apathy. According to Kagen surprise and newness "recharge the attention system."[5]

Many studies appear to support the importance of discovery learning when student motivation is concerned. Discovery, whether it be inductive or deductive teaching, tends to increase student curiosity and cognitive energy toward closure. By taking advantage of this relationship between student curiosity and learning activities involving discovery, teachers may improve student motivation in their classrooms.

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[3]Byron G. Massialas and Jack Zevin. "Teaching Through Discovery," Social Education, 28:384-387; November 1964.

[4]Jerome Kagen, "Personality and the Learning Process," Daedalus, 94:559-563; Summer 1965, p. 560.

[5]Ibid, p. 562.

Many other factors related to individual involvement and motivation in learning situations are affective in nature. Learning activities which involve affective components (values, beliefs, feelings, emotions and self) create more personal learning, and, increased student involvement.[6] Hunt and Metcalf also have argued that motivation and serious thinking is greatest when students can be made to feel a problem. Discovery learning can be designed to stimulate student affect as well as curiosity.

Teachers rarely employ discovery learning aimed at student curiosity and/or affect. Too often teachers are only interested in presenting information, principles, conclusions, ideas and opinions of others rather than in introducing more "open-ended" situations for students to think about. Used to introduce new topics and "recharge" student motivation throughout extended units of instruction, discovery episodes can increase interest and involvement in many classrooms.

Treatment

Four different treatment groups were used to demonstrate the effectiveness of discovery episodes at different levels of instruction. One seventh grade history class, two pre-service (secondary and elementary) education classes, and an in-service teacher workshop were selected. The discovery episodes used were developed for learning concepts, generalizations and factual content related to westward migration, Morman migration and the general topic of migration.

Instruction included a "puzzling" document, an inductive discussion

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[6]George Isaac Brown, Human Teaching For Human Learning. New York: The Viking Press, 1972.

of hypotheses related to migration, two "emotion-oriented" letters, a discussion of values, a data collection exercise, and small-group role plays presenting conclusions drawn from interpreting research. The instruction was completed in a period of 3 hours in each group.

In the seventh-grade history class the instruction was used as an introduction to a unit on migration in American History while in the other three groups, the instruction served as a demonstration lesson of discovery and inquiry--oriented teaching.

Treatment Summarized

A summary of the treatment used with the four experimental groups is presented below. Each group was compared individually on pre- and post-indicators of interest. The order of treatment was as follows:

1. Measure of interest in topics related to migration
2. Read "Unusual Ghost Town" (Appendix A)
3. Large group hypothesizing discussion (Appendix B)
4. Break
5. Read Letters to the Mormans (Appendix C)
6. Hypothesis testing and normative discussion (Appendix D)
7. Subjects' identification of study topics (Appendix E)
8. Break
9. Individual and small group research
10. Discussion and role playing of findings
11. Measure of interest in topics

Results

Significant differences were found between each group's initial interest and interest after instruction. Several topics previously desig-

nated as of "little or no present interest" were chosen, after instruction, as having "high present interest." Subjects tended to choose both general topics related to migration and specific topics related to westward and Morman migration as well.

Similarly, topics identified by students for further personal research were directly related to both specific and general themes explored during instruction. These topics were suggestions openly sollicited from the students before the final measure of interest was administered.

Subjects in all four groups also favored the wide variety of resources employed (documents, cassette tapes, filmstrips, songs, pictures) in the small-group research over a single resource (text, one document, filmstrip, etc.) usually used with all students within a classroom. Finally, subjects in all four groups tended to agree that the discovery episodes and "inductive-open" discussions were enjoyable, especially the small-group role-playing. Many subjects felt that their interest was aroused while trying to "figure out" problems and issues raised and while searching for and examining evidence to support or refute each others claims.

Conclusions

The results of the study tend to support the position that discovery learning produces increased interest and involvement in content to be learned. Since active involvement and higher interest does not ensure effective learning, teachers may use an "infusion approach." This means that discovery episodes could be combined with other learning modes (e.g., lecture, mediated-instruction, readings, inductive and deductive presentations) to capitalize on their ability to generate higher interest and involvement while other modes are more specifically aimed at particular content and skill objectives. One

major conclusion of this study is that discovery episodes may be one teaching means by which affective objectives (e.g., increasing students attitudes toward instruction) may be achieved.

Another conclusion which can be drawn from this study is that students tend to favor a wide variety of resources and activities. The discussion following the role play was productive and interesting because each group had a "new piece of the puzzle." That is, since each group was analyzing different data sources and collecting a wide variety of information, other students were more willing to listen because each new piece of information filled in gaps stimulated by the discovery episodes and open-ended questioning. At times, information provided by one group answered questions raised by other groups during their own research, while at other times, information presented by one group lead to questions, challenges, debates and further interest.

The use of discovery episodes related to both cognition (curiosity) and affect (emotions, values, beliefs) resulted in higher interest and involvement. Used effectively, both cognitive and affective episodes aimed at student discovery of concepts, generalizations, data, values of others, etc., may provide alternatives to increasing student interest and involvement while acting as a springboard into areas of content.

Although the examples used throughout the study were based upon social science, there is experience from other similar lessons in science, math and english that tends to support the notion that such results might occur in areas other than social studies. Further studies in all areas should be conducted to develop models using discovery episodes as motivators and initiators of learning activities in many content areas.

Massialas, et. al have argued that inquiry teaching which stimulates

student hypothesizing and position taking without emphasizing the testing of the hypotheses and positions offered (non-probing inquiry) resulted in lower student attitudes toward the class and lower scores on a measure of critical thinking than what they called probing inquiry.[7] Probing inquiry can be defined as teaching which stimulates a high degree of student hypothesizing and position-taking combined with extended efforts at finding and validating evidence to support, modify or reject hypotheses and positions. Results of this study may add support to the claims made by Massialas, et.al. One factor in the increased interest and involvement of subjects in this study was the search for further data and the probing for evidence to support the large number of claims made throughout the period of instruction.

The interest generated by the discovery activities employed with the teacher education groups (pre-service and in-service) demonstrates that more creative use of discovery learning in teacher training programs may also result in increased student interest and active involvement. Oftentimes, teacher trainees and in-service teachers complain about the extensive use of lectures and other didactic teaching techniques in teacher education programs. Again the timely use of discovery episodes in teacher training may decrease such complaints, increase teacher affect and demonstrate discovery techniques as well.

Discovery learning is often attacked because of the extended time it takes and its inefficiency in the learning of great numbers of facts. It appears that discovery may be justified as a means to increase student interest and active involvement as well as springboards into subject related areas.

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[7]Byron G. Massialas, Nancy Sprague and JoAnn Sweeney, Structure and Process of Inquiry into Social Issues in Secondary Schools. Vol. III, Ann Arbor, Michigan: University of Michigan, 1970.

Through the use of well-timed discovery episodes, teachers may be able to increase the overall effectiveness of student learning by increasing their attitudes toward the content to be learned. This hypothesis needs much greater testing in more controlled and creatively designed experimental situations. It does appear that discovery activities used properly may be justified on the grounds that they may improve the psychological, affective and social dimensions of a classroom.

Appendix A

An Unusual Ghost Town

"A few years ago, I took a steamboat up the Northern Mississippi in the fall when its waters were low. I got off the steamboat at Keokuk, Iowa. I rented a carriage and stopped for a bite to eat. I drove the carriage through a barren land of bandits, vagabonds, and lazy settlers. They had done nothing to use or beautify the land.

I was coming down the last hillside of my journey when I saw a beautiful place. On the bend of the river was a city shining in the fresh morning sun. It had bright new houses and rich, green gardens. The town was settled around a hill on which I could see a large marble temple. A high steeple was shining white and gold in the sun. A sign read, "Church of Saints." Beyond it, in the background, there was plowed land looking like a checkerboard of green, brown, and yellow squares. Someone had been hard at work here. It was a very beautiful sight.

I was curious to visit this place. I borrowed a boat and rowed across the river to the city's wharf. No one met me there. I looked and saw no one at all. I could hear no one move. The only sounds to be heard were the buzzing of flies and the water ripples hitting against the beach. I walked through the empty streets. The town lay as if in a dream. It was clear that the city had not slept for a long time. There was no grass growing up in the streets and there were still some footprints in the dust. There was no one there to stop me. I went into empty workshops and stores everywhere. The spinner's wheel was still. The carpenter had left his loaded work bench. Fresh bark was still in the tanner's vat. Freshly chopped wood stood piled against the baker's oven. The blacksmith's shop was cold, but looked as though he had just gone off.

No one called to me from the open windows. Not even a dog barked at me. I walked into some houses. I found nothing but cold ashes on the hearths and squeaking floorboards.

On the outskirts of town was the city graveyard. There was no new sign of plague on the tombstones. It did not look any different than any other graveyard I had ever seen before. Beyond the graveyard, out in the fields, I saw in one spot an orchard of ripe fruit trees. Field after field of heavy-headed yellow grain lay rotting ungathered upon the ground. No one was there to get the rich harvest.

Such a ghost town I had never seen. I kept wondering. Who lived there? Where had they gone? Why had they left?"

Appendix B

Discussion Questions

Problem Definition Questions:

1. What is this story really about?
2. What seems to be the problem here?
3. Why is this story entitled the "Unusual Ghost Town"?
4. If you were Colonel Kane, what would you think? Why?
5. Is there anything unusual about the ghost town? Explain.

Hypothesizing Questions:

1. Why are there no people in the town?
2. Why might the city be a ghost town?
3. Why do ghost towns appear?
4. Why do people move from place to place?
5. What things might make you and your family move? Why would they make people move?

Additional Questions:

1. How might the people of the town have felt about moving away? Explain what you mean.
2. How might you feel if you were in a ghost town by yourself?
3. If you were to move away from where you live now, how would that make you feel? Why?
4. Have you ever moved in the past? How did that move make you feel? Why?

Sample Hypotheses Generated

1. People may move because they are attracted to new places.
2. People are often attracted to new locations by powerful economic forces such as gold, riches, land, employment, and profits.
3. People may be attracted by opportunities for religious and/or political and/or social power.
4. People may be induced to move by such factors as a better food supply, more resources, family ties, friends nearby, weather, schools, and adventure.
5. People may migrate because they are driven away from their own homes.
6. People may be driven away by war, famine, fire, flood, plague, and fear.
7. Many people move because of lack of employment.
8. Religious and political persecution often leads to migration.
9. People may not move for many of these same reasons.

Appendix C

To: Brigham Young April 8, 1845
President of the Mormon Church

If you can get off by yourself, you may find peace. But surrounded by such neighbors, I do not think you will be happy here. I was told by Joseph Smith last Summer that he was thinking about a move then. If he were alive, he would have begun to leave before now.

I advise you to go. California now has open land for a new life. Few people live there. Why don't you go out there and take over some of the country. You can start your own government there. You could stay there a long time before you would be distrubed by other settlers.

T. Ford, Governor of Illinois

To: Mormons of Nauvoo October 3, 1845

You have told us that you will be willing to go. This committee and our whole community expect you to leave Illinois with your whole church group. If you do not, then we are sure that something will happen. We hate violence and blood shed, but we will use them to make you leave.

We think that you should leave. Start getting ready now. Then you can leave in peace. To keep law and order until then, armed men from the state militia (army) will stay here.

With many wishes that you find the peace and good life which you want in the west.

The Quincy Committee
John J. Hordin W. B. Warren
S. A. Douglas J. A. McDougal

Appendix D

Discussion Questions

Problem Definition and Analyzing Questions:

1. What are these letters about?
2. What do they tell us about the People of Nauvoo? About their neighbors?
3. What new information do these letters provide us?
4. What problems or issues are involved here? Why are they problems?
5. Are there any similarities and differences in the two letters? Explain your answer.

Hypothesizing and Hypothesis-testing Questions:

1. Which of our hypotheses are supported by the new data? Why?
2. Which hypotheses are not supported? Why?
3. What other information do we need?
4. Why do many people move? Why might the Mormons have moved West?
5. Why might the Mormons have stopped in Salt Lake Valley? Why do people live where they do?
6. The Mormons sang many songs on their way west. What ideas and words might we find in these songs? Why do you think so?
7. Would songs be good sources of information about how people feel and think? Why or why not? Give examples.
8. Have other people moved for similar reasons? Explain and give examples.

Feeling and Normative Questions:

1. How do these letters make you feel? Why?
2. How must the Mormons have felt? Why do you think so?
3. How would you have felt after getting such a letter? Why?
4. Do you think the Mormons should have moved? Explain your position.
5. What should people do when they are threatened? When denied their religious freedom and rights? Why? What are the implications of that position? What would happen if everyone thought and acted that way?
6. How should people threat others who do not share their own religious and political beliefs? Why?

Appendix E

Sample Topics Generated By Subjects (7th Grade History)

What is polygamy and are Mormons still allowed to have more than one wife? Was this a cause of their moving?

Did all the Mormons leave? Did some stay and fight? Were they pacifists?

What violence occurred? Did the Mormons move many times? Why? Why did they stop in Utah and not go on to California?

Where did the Mormons come from? What did they believe?

How did they make a living? What were their customs?

What was the gold rush? How did it begin?

What cities have been wiped out by plague?

What happened to Nauvoo? What is it like today?

How did they get to Salt Lake? What was the trip like?

Who were the Quincy committee? Why did they write the letter?

Why didn't the Illinois and National governments help the Mormons?

Why do ghost towns occur? What ghost towns have been famous in our history? What other famous migrations has there been?

Why are people prejudiced? What is happening in Ireland?

How has prejudice affected American History?

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